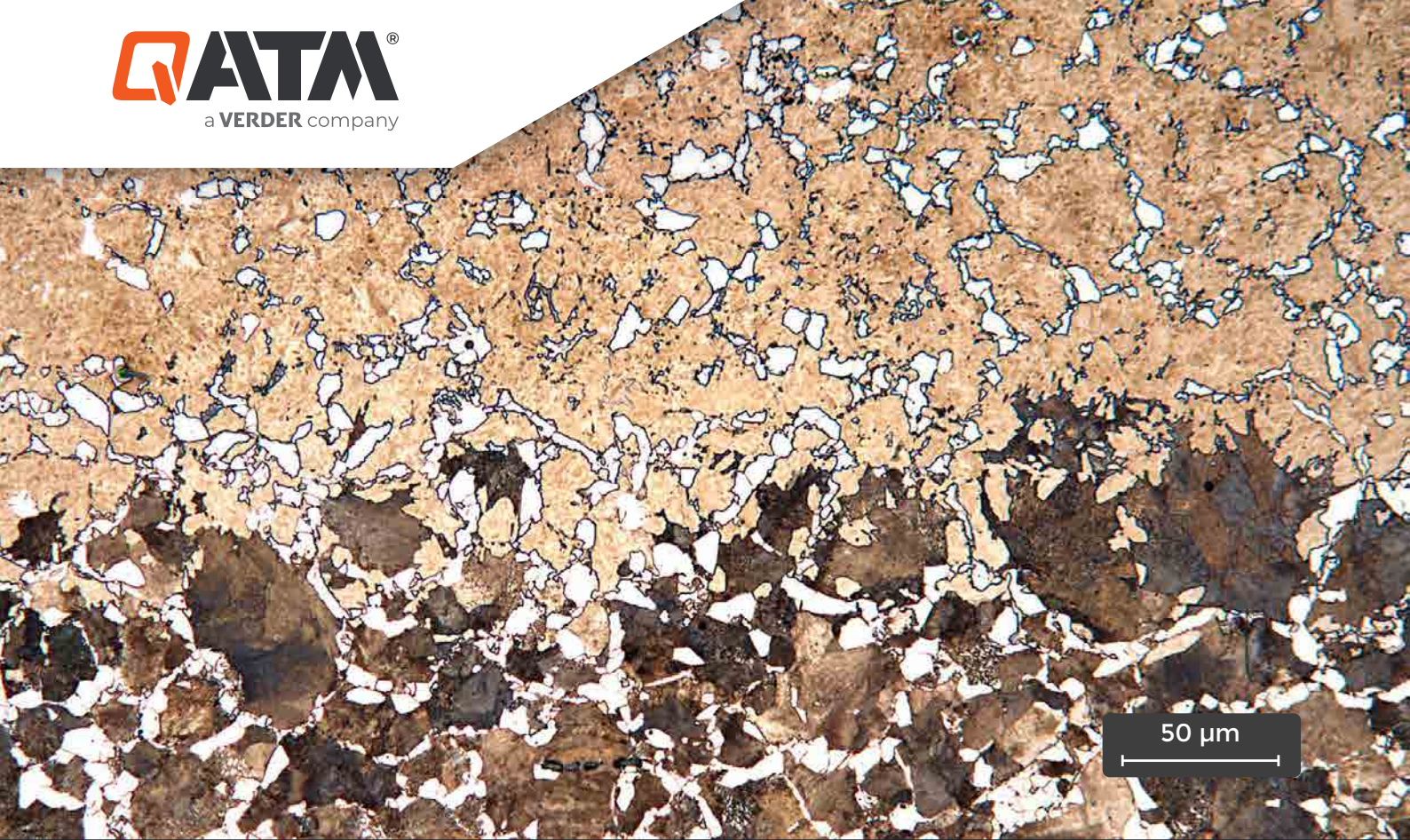




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METALLOGRAPHIC PREPARATION OF A GEAR RACK

Objective:

This report examines the metallographic preparation of inductive surface hardening of gear teeth.

The metallographic preparation of inductively surface-hardened gear teeth is an essential step in evaluating the microstructural changes resulting from the hardening process. The aim of this method is to reveal the characteristic microstructural formations in the surface layer and core of the gear tooth and to assess the quality of the heat treatment. Careful grinding, polishing and etching of the sample surface reveals the different phases and hardness profiles within the hardened zone. Metallographic analysis provides important information about the hardening depth, the course of the hardness limit and potential defects such as cracks or decarburization that can occur as a result of inductive heating and quenching. The findings are crucial for optimizing the process parameters and ensuring the functionality and service life of the gear teeth.

CUTTING

Device	Qcut 600 BOT	
Cut-off disc	Al ₂ O ₃ cut-off wheel FS-C 600	Item no.: 95012569
	Al ₂ O ₃ cut-off wheel FS-D 600	Item no.: 95012568
Coolant and anti-corrosion agent	QATM-Standard	Item no.: 95014282
Clamping tool	Qtool 80	Item no.: Z2231200
Cutting method	Vertical cut (Y-axis)	
Parameter	- Feeding speed	0.15 mm/s
	- Pulse setting	-
	- Rotational speed of cut-off wheel	1500 rpm

Notes



Large cut-off machine
Qcut 600 BOT

Clamping of the gear rack in Qcut 600 BOT



HOT MOUNTING



Hot mounting press Qpress 50

Device	Qpress 50	
Mounting material	EPO BLACK	Item no.: 95011991
Heating time	6:00 min	
Temperature	180 °C	
Pressure	250 bar	
Cooling time	4:00 min	
Accessories	-	
Heat set up	100%	
Pressure mode	Pressure from beginning	
Cooling set up	100%	

Notes

The cut samples on the piston of the hot mounting press





Automatic grinding and polishing machine Qpol 300 A1 Eco+

GRINDING/POLISHING

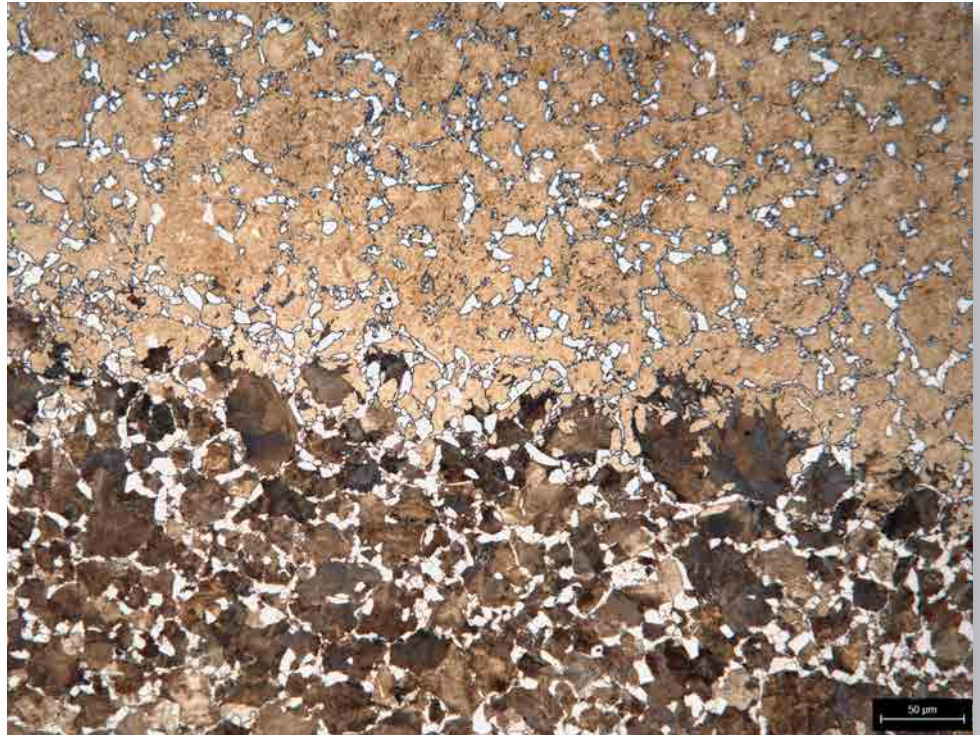
Device	Qpol 300 A1 Eco+	
Sample holder	6 x 40 mm	Item no.: Z5446025
Pressure	Single pressure	

STEP	MEDIUM		 rpm	 rpm	 Single pressure N	 min
 Pre-grinding	VEGA 54 µm	H ₂ O	200	120 ►► Synchronous Rotation	30	1:30
 Pre-polishing	BETA	Dia-Complete Poly, 9 µm	150	120 ◄◄ Counter Rotation	30	5:00
 Polishing	SIGMA	Dia-Complete Poly, 3 µm	150	120 ►► Synchronous Rotation	25	5:00
 Polishing	ZETA	Dia-Complete Poly, 1 µm	150	120 ►► Synchronous Rotation	22	2:00
 Etching (chem.)	3% alc. Nitric acid					0:02
Notes	- Pre dosing time for 9 µm, 3 µm and 1 µm = 3 s - Dosing interval and dosing duration for 9 µm, 3 µm and 1 µm = every 30 s for 1,5 s					

The microstructure on the edge region after etching under optical microscope- 25:1



The transmission region under optical
microscope – 200:1



CONCLUSION

1. The component could be cut using the Qcut 600 BOT and the correct parameters without re-clamping. No deformation or burns were detected after cutting.
2. The sections were mounted in EPO BLACK mounting material using the Qpress 50 hot mounting press: Qprep EPO BLACK is a fine-grained, thermally curing hot mounting material based on epoxy resin. As a hot mounting material that does not require labelling, it contributes significantly to improving occupational safety in the laboratory.
3. Due to the fine surface after cutting, only one grinding process is required to prepare the sample for further polishing.
4. With DIA. Complete diamond suspension with 9 µm, 3 µm and 1 µm grain size on the corresponding polishing cloths, the sample surface can be prepared for examination under the microscope without metallographic artefacts. Qprep DIA-Complete Poly (polycrystalline) is an all-in-one diamond suspension.

OUR PRODUCT OF THE MONTH

DIA-Complete Poly all-in-one diamond suspension

Find out more at
www.qatm.com